

A Study on the Relationship between Employee Improvisation and Innovative Performance of Internet Enterprises

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Keywords: Employee improvisation; Knowledge creation; Innovative performance

Abstract. This study examines the impact and mechanism of employee improvisation on innovative performance of Internet enterprises from the light of individual. On the basis of exploring the relationship between employee improvisation and innovative performance, this paper analyses and verifies the mediating effect of knowledge creation on the above relationship. This study takes 176 Internet employees as research object, and the results show that: employee improvisation has a significant positive impact on knowledge creation and innovative performance; knowledge creation plays a partially mediating role between employee improvisation and innovative performance.

1. Introduction

In modern society, Internet enterprises are facing increasingly fierce competition, uncertainties and dynamic choices. Improvisation comes into being in a complex and changeable environment. As a new research topic, improvisation has a tremendous impact on the operation of enterprises in the case of resource-scarce settings and highly uncertain markets.

The environment of intense market competition, rapid change of consumer demand and acceleration of technological renewal has created opportunities for the development of Internet enterprises, but also posed serious challenges. Due to the complexity and uncertainty of technology research and development, product innovation and market development, Internet enterprises need to encourage their employees to exert improvisation as a supplement to formal planning when traditional planning methods can't adapt to the rate of market change. Employees can bypass the organization's formal planning system and complete tasks by performing personal improvisation and breaking routines, so improvisation is regarded as an unconventional way of accomplishing tasks ^[1].

Improvisation can effectively help Internet companies to cope with unexpected events. In a highly turbulent environment, improvisation plays a vital role related to the survival and development of enterprises, but it is highly uncertain. The relationship between employee improvisation and individual innovative performance needs to be verified. Although many studies have found a positive relationship between improvisation and innovative performance ^[2-3], some studies show that there is little or even a negative relationship between them ^[4], indicating that improvisation isn't a sufficient condition for innovative performance. The reason is that there are few studies on the intermediate variables affecting the relationship between improvisation and innovation performance, and the mechanism of action is still unclear ^[2]. Innovation activities are complex, and knowledge is the scarcest resource to complete innovation. Introducing knowledge creation as a mediation variable from the light of individual, the relationship between employee improvisation and innovative performance will be deeply studied, which provides theoretical basis and practical guidance to more effectively manage and utilize employee improvisation. In addition, the extensive research on improvisation is mainly based on the team or organizational level, and the research on individual improvisation is still less ^[2]. However, employees are the main body of the organization, and individual improvisation is the basis of organizational improvisation. Therefore, it has certain theoretical significance to explore individual improvisation.

With the development of artificial intelligence and information technology, the Internet industry has great potential and development interspace. However, because of the increasing diversification and personalized of Internet user demand, Internet enterprises need to pay attention to the viability brought by technological and competitive advantages. In addition, it is more important to focus on responsiveness and innovation ability when facing the complex and turbulent environments. Therefore, research on Internet enterprises has great practical significance.

2. Literature Review

2.1. Employee Improvisation

Improvisation is a common phenomenon in the field of dance, music and theatrical performances. Weick^[5] firstly introduces improvisation as a metaphorical concept to organizational management theory, and considered that “to do things spontaneously is to become more skilled at thinking on your feet.” This emerging research topic has received extensive attention from scholars. The research on improvisation is divided into two phases. The first phase is to analyse the organizational improvisation by using the improvisation in the field of music and drama performance as a metaphor. The second phase is to describe the characteristics, definitions, dimensions of improvisation and its relationships with knowledge and creativity in the field of management based on grounded theory or empirical research. The research dimensions include individual, team and organizational improvisation in the field of management. Organizational improvisation builds on individual improvisation^[4]. Moorman and Miner^[4] believe that fast learning and adaption without much advance planning are important to firm survival, and improvisation can be an effective choice when a firm faces environmental turbulence that requires action in a time frame that is shorter than a regular planning cycle. Improvisation is the deliberate integration of planning and execution in order to produce innovative performance. However, improvisation does not mean that it can produce innovative effects, but emphasizes the non-arbitrariness of action and achieves breakthroughs purposefully. To understand more about improvisation undoubtedly will help us get a better grasp on innovation^[5]. According to the research conclusions of Vera and Crossan^[3], they highlight improvisation as a conscious choice people make rather than as random behaviour, and extract the descriptive elements of spontaneity and creativity, defining improvisation occurring in teams as the creative and spontaneous process of trying to achieve an objective in a new way. The spontaneous dimension incorporates a time orientation to the improvisation construct. In addition, the creative dimension incorporates the search for novelty and usefulness in improvisational actions. Domestic scholar Yao^[7] believes that improvisation is mainly caused by emergencies, not only in action, but also in the process of its implementation. Its purpose is to avoid risks, reduce losses, further increase profits, and make the organization more efficient. Therefore, improvisation is to cope or ingeniously adapt to a set of circumstances, devising resourceful solutions to intracTable problems in crisis situations, where time is an obvious scarce resource and spontaneity is at a premium.

2.2. Knowledge Creation

Nonaka and Von Krogh^[8] believe that knowledge creation is generated by the constant interact of tacit and explicit knowledge. Through knowledge conversion, practitioners may discover new ways of defining problems and searching for solutions. The forms of knowledge conversion include: knowledge socialization, knowledge externalization, knowledge combination and knowledge internalization. Knowledge creation is the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it to an organization's knowledge system. In other words, what individuals come to know in their work benefits their colleagues and, eventually, the larger organization^[9].

2.3. Innovative Performance

Innovation can be divided into different levels such as country, enterprise, team and individual. For the macro level such as country and enterprise, the importance of innovation is self-evident, but the direct implementer of innovation activities is individual. For the enterprises, the realization of innovative goals must be completed through employee innovation. In other words, innovation ability and level of enterprises builds on the employee innovative performance. Han Yi ^[10] believes that employee innovative performance is the unity of employee innovation willingness, innovation action and innovation results. Specifically, employee innovation performance is a series of innovative activities implemented by employees to achieve innovation goals, which produce valuable innovative results for individuals or organizations. This paper studies employee innovative performance of Internet enterprise from the individual level, which refers to the results and effectiveness of individual innovative activities.

3. Hypothesis Development

3.1. Employee Improvisation and Innovative Performance

Yao ^[7] summarizes the relationship between organizational improvisation and innovative performance. He believes that organizational improvisation affected by different moderating and mediating roles would have different results on innovative performance. However, the general idea in academia is that improvisation always leads to positive outcomes and better performance. Foreign scholars Vera and Crossan ^[3] believe that creativity of organization members promotes innovative performance, and improvisation promotes organization's absorption of new knowledge and market operation flexibility. Akgün and Byrne etc. ^[11] study the relationship between improvisational ability of new product R&D teams and success of new product R&D, and consider that improvisation in teams is positively related to new product R&D in dynamic environment. It is found that the relationship between improvisation and new product R&D performance is mediated by environmental dynamics and real-time information transmission. Domestic scholars Wu and Qiu ^[2] find that both spontaneity and creativity of improvisation have a positive impact on innovative performance in teams. From the emergence of innovation to the execution of innovation, organizational improvisation can promote team performance very well. Therefore, it is suggested that teams should take more measures to enhance improvisation based on both spontaneity and creativity and then to improve organizational performance. Although these studies are at the organizational and team level, organizational improvisation is a systematic integration of individual improvisation at the organizational level. Therefore, it is considered that there is a significant relationship between employee improvisation and innovative performance. Based on this, we put forward the hypothesis:

H1: Employee improvisation positively affects innovative performance.

3.2. Employee Improvisation and Knowledge Creation

Internet companies often encounter sudden and tough problems, which are difficult to solve relying on the organizational routine processes and existing practices. Moreover, these problems often occur in the context of uncertain environment and imperfect information. Employees need to use their wits to solve these problems cleverly. Crossan ^[12] argues that individuals often rely on intuition and insight to propose new solutions to these problems in this case, and then to create new knowledge.

Improvisation is a distinct type of organizational learning, and it can be described as 'real-time, short-term learning'. Improvisation may produce new thinking patterns, action plans and explanatory frameworks ^[13]. Improvisation is a transition of the existing cognition, and a modification, supplement and reconstruction of organizational memory, which can break the constraints of existing cognition and organizational memory so as to provide conditions for

knowledge creation ^[14]. Wu ^[2] believes that the improvisation of R&D team members can help to produce new knowledge or apply knowledge in a new way. Experience learning and creation occur at the same time. When facing incomplete action plan, enterprises acquire knowledge while “thinking while doing”. The outcome of improvisation is survival and learning by doing understood as creation or upgrading of knowledge, skills and competency. In summary, we put forward the hypothesis:

H2: Employee improvisation positively affects knowledge creation.

3.3. The Intermediary Role of Knowledge Creation

Ruan's ^[16] research on relationship between organizational improvisation and innovative performance of technological enterprises based on the intermediary effect of tacit knowledge shows that organizational improvisation is conducive to the production of improvisational knowledge, and tacit knowledge plays a mediating role between organizational improvisation and innovative performance. Heng ^[17] considers that knowledge ability and motivation are two important factors affecting employee innovative performance, and the level of employee capacity to produce innovative performance is determined by their knowledge ability. Qian and others ^[18] believe that knowledge creation plays a completely mediating role in the relationship between organizational learning and innovation performance. In summary, we put forward the hypothesis:

H3: Knowledge creation plays a mediating role in the relationship between employee improvisation and innovative performance.

Based on the literature review and research hypothesis, the theoretical model is illustrated in Fig. 1.

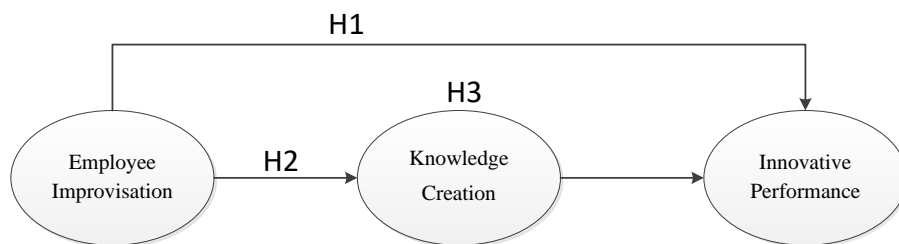


Figure 1 Theoretical framework.

4. Research Design

4.1. Sample and Data Collection

The questionnaire data for this study were gathered by surveying employees in the Internet enterprises using 5-point Likert Scales. Questionnaires are sent out online. These efforts finally yielded 213 responses. After deleting invalid answer, we finally obtained 176 valid responses. The effective response rate was 82.6%.

4.2. Variable Measures

Control variables: Considering that some variables may have an impact on the results of the study, we treat employees gender (GD), education (EDU), years of service (YEAR) and company size (CS) as control variables in this study.

Independent variable: employee improvisation (EI). This study uses the measurement developed by Vera and Crossan ^[19]. They measured improvisation for the first time from two dimensions of spontaneity and creativity. At the aspect of spontaneity, Vera and Crossan mainly referred to the measurement developed by Moorman and Miner. At the aspect of creativity, they referred to the measurement of creative ability. The reliability of the scale has reached 0.91, indicating that it is excellent reliability.

Intermediate variable: knowledge creation (KC). The SECI model is proposed by Nonaka and the scale of organizational knowledge creation have been used by many scholars for a long time. It is proved that the scale has excellent reliability and validity. However, this scale is based on the organizational level. There are few studies on the individual level. Based on Nonaka's SECI model, we refer to knowledge innovation scale developed Han ^[20] and the questions about employee knowledge creation in Liu Ting's graduate paper ^[21].

Dependent variable: innovative performance (IP). We refer to the scale of employee innovation performance developed by Han ^[10]. It includes three aspects: innovation will, innovation action and innovation results.

4.3. Test of Reliability and Validity

In this study, we apply Cronbach's alpha analysis to measure the inner stability and consistency of the Likert Scale. As is shown in Table 1, the Cronbach's α for employee improvisation, knowledge creation and innovative performance are all above 0.7. The Cronbach's α of variables are all greater than 0.7, indicating that the reliability of each variable is acceptable. We apply the KMO method and Bartlett sphericity Test to test whether the items suit exploratory factor analysis. Table 2 shows that KMO values of employee improvisation, knowledge creation and innovative performance are above 0.7. Furthermore, the effect of Bartlett sphericity is significant, which shows that the construct validity of the model is high.

Table 1 Construct reliability.

Concept	Number of subjects	Cronbach's α Coefficient
Employee improvisation	6	0.781
Knowledge creation	6	0.814
Innovative performance	6	0.854
Total	18	0.917

Table 2 Construct validity.

Constructs	KMO Value	Bartlett Sphericity Test
Employee improvisation	0.750	0.000
Knowledge creation	0.868	0.000
Innovative performance	0.820	0.000

5. Analysis and Results

5.1. Descriptive Statistics and Correlations

Before regression analysis, we carry out descriptive statistics and correlations. As Table 3 shows, the Spearman correlation coefficient matrix indicates a significant positive correlation among employee improvisation, knowledge creation and innovative performance, which provides a good basis for regression analysis. At the same time, Spearman correlation coefficients among variables are all below 0.7, which indicates that degree of multi-collinearity of variables is low.

Table 3 Correlation matrix.

Variable	1	2	3	4	5	6	7
1.GD	1						
2.EDU	-0.004	1					
3.YEAR	-0.244**	-0.403**	1				
4.CS	-0.175*	0.081	-0.016	1			
5.EI	-0.102	0.256**	-0.091	-0.038	1		
6.KC	-0.112	0.333**	-0.133	-0.050	0.565**	1	
7.IP	-0.022	0.351**	-0.207**	-0.071	0.539**	0.653**	1
average	1.67	3.29	1.79	2.56	3.51	3.65	3.72
S.D.	0.471	0.669	0.706	1.227	0.632	0.658	0.639

^a.EI- employee improvisation ; KC- knowledge creation; IP- innovative performance

5.2. Regression Analysis

This study adopts a four step approach proposed by Baron and Kenny to examine whether knowledge creation has a mediating effect between employee improvisation and innovative performance. First, it is examined whether the employee improvisation has a significant impact on the innovative performance. Secondly, it is examined whether the employee improvisation has a significant impact on the knowledge creation. Thirdly, it is examined whether the knowledge creation has a significant impact on the innovative performance. Finally, the mediating effect of employee improvisation is examined.

As Table 4 shows, we find that the control variable such as employees gender, years of service and company size have no significant effect on knowledge creation and innovative performance in Model 1 and Model 3. We introduce employee improvisation into Model 2, and regard knowledge creation as a dependent variable and employee improvisation as an independent variable. The F equals 19.573 ($P<0.01$) and the β index of employee improvisation towards knowledge creation is 0.502($P<0.01$), which shows that employee improvisation has a positive effect on knowledge creation. Hypothesis 2 is confirmed. In Model 4, we regard innovative performance as a dependent variable and employee improvisation as an independent variable. The β index of employee improvisation towards innovative performance is 0.476($P<0.01$) and the F equals 18.273($P<0.01$), which shows that employee improvisation has a positive effect on innovative performance. Hypothesis 1 is confirmed. In Model 5, we regard innovative performance as a dependent variable and knowledge creation an independent variable. The F equals 28.288($P<0.01$) and the β index of knowledge creation towards innovative performance is 0.601($P<0.01$), which shows that knowledge creation has a positive effect on innovative performance. In Model 6, we introduce the employee improvisation and knowledge creation at the same time, the β index of knowledge creation towards innovative performance is 0.474($P<0.01$), but the β index between employee improvisation and innovative performance declined from 0.476($P<0.01$) to 0.238($P<0.01$). Thus knowledge creation acts as a partially mediating variable between employee improvisation and innovative performance. Hypothesis 3 is confirmed.

Table 4 Regression results.

DV	Knowledge Creation		Innovative Performance			
	M1	M2	M3	M4	M5	M6
GD	-0.138	-0.078	-0.063	-0.006	0.020	0.031
EDU	0.326**	0.199**	0.321**	0.200**	0.125	0.106
YEAR	-0.037	-0.027	-0.094	-0.085	-0.072	-0.072
CS	-0.101	-0.061	-0.109	-0.071	-0.049	-0.043
EI		0.502**		0.476**		0.238**
KC					0.601**	0.474**
R ²	0.134	0.365	0.141	0.350	0.454	0.492
Adjust R ²	0.114	0.347	0.121	0.330	0.438	0.474
F	6.622**	19.573**	7.032**	18.273**	28.288**	27.319**

^b.EI- employee improvisation ; KC- knowledge creation; IP- innovative performance

^c. * $p<0.05$; ** $p<0.01$ (two-tailed tests)

6. Discussion

6.1. Conclusions

There are increasing internal and external challenges in the Internet era, the life cycle of enterprises is shortening. More and more enterprises hope to solve problems and improve performance through various effective methods. As a common phenomenon in Internet enterprises,

improvisation is gradually accepted by managers. This paper studies the mechanism between employee improvisation and innovative performance through questionnaires. The empirical results confirm the hypothesis of this paper.

Firstly, employee improvisation has a significant positive impact on knowledge creation and innovative performance. Employee improvisation always occurs in case of emergency, employees rely on intuition and insight to solve problems. In this process, the existing knowledge is reorganized, and a new train of thought and method is generated and constantly improved to create new and valuable knowledge. Improvisation is not a random decision, but a conscious and immediate decision-making based on prior knowledge. In a dynamic environment, the previous knowledge and experience can help employees evaluate the current environment and analyse the existing problems. Employees can find similar paths in the process of improvisation or creatively reorganize the past paths to adapt to the new environment. Therefore, on the basis of initiative, improvisation can solve complex problems more effectively and rapidly, and then promote innovation performance.

Secondly, knowledge creation plays a partially mediating role between employee improvisation and innovative performance. In other words, in order to improve innovative performance, it's necessary to take knowledge creation as an intermediary which can produce a transmission effect. Improvisation usually occurs in an emergency or in the acute event when original plan or organizational routine can't adapt to the new changes, but solutions must be formulated immediately. Improvisation is the adjustment to this situation, but it also has certain risks and uncertainties. There are always some shortcomings in the new ideas and schemes improvised initially by employees. The new ideas and schemes may not directly produce performance. Employees need to share knowledge and exchange information with other members to improve schemes, reduce risks and uncertainties, and then integrate into available knowledge. All these promote the rapid and flexible development of innovation activities and improve innovative performance.

Most of the researches focus on the organizational and team improvisation, while few studies focus on the individual. Employees are the main body of an organization, and employee improvisation is the basis of organizational improvisation. This paper studies employee improvisation from a micro perspective, which helps to better explain the phenomenon of organizational improvisation. At the same time, we introduce knowledge creation as an intermediary variable, which enriches the relationship between employee improvisation and innovative performance.

6.2. Limitations

There are some limitations in this paper. First, the sample size and scope are limited, so the empirical results need to be further tested. Second, this study only chooses knowledge creation as the mediating variable. There are other mediating variables and moderating variables between employee improvisation and innovative performance, which need further exploration.

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